AGRONOMY,

UNDERGRADUATE STUDY PROGRAMME, FIRST BOLOGNA CYCLE

COURSE DESCRIPTIONS

COMPULSORY COURSES

COMPULSORY COURSES FOR THE 1ST YEAR OF STUDY

Course name: **PLANT BIOLOGY**
Number of ECTS credits: **6**

Content:
Main topics:

Plant cell and tissues
- Differences between prokaryotic and eukaryotic cell, differences between plant and animal cell.
- Main organelles in plant cells, their structure and function.
- Basic properties of simple and complex tissues.

Vegetative plant organs
- Anatomical and morphological organization of stems, leaves, roots and their transformations.
- Secondary plant growth and wood.

Flowers and reproductions.
- Reproductive cycle of higher plants.
- Flower structure, pollination and the importance of pollinators.
- Fruits, seeds, their dispersal and germination physiology.

Introduction to plant ecology
- Anatomical, morphological and physiological adaptations to different environments, especially to conditions in the Mediterranean.

Introduction to plant systematics
- Systematic categories and nomenclature.
- Taxonomic entities and the definition of species.

Most important systematic groups of herbaceous grassland species, wild crop relatives and weeds.

Course name: **CHEMISTRY BASICS**
Number of ECTS credits: **6**

Content:
The short summary of basic chemical concepts: atom, molecule, ion, element, compound, pure substance, mixture, formulas, etc. will be given in the beginning of the subject.
In chapters dealing with the amount of substance, relative atomic and molecular weight, and molecular weight the basics tutorial will be given.
Field structure of atoms and chemical bonds will focus on the importance of chemical bonds within the molecules and atoms of the building and the periodic table of elements. A basic overview of dispersion systems and balancing chemical reactions inside will be introduced. The overview of inorganic

compounds will be taken according to the periodic table of elements, and organic functional groups. The subject will be based primarily on the acquisition of fundamental knowledge of chemistry necessary to understand the content of other agriculture subjects of the study Mediterranean agriculture.

Content (Syllabusoutline):

1. Basics concepts
   - Atom, molecule, ion
   - Element, compound, pure substance, mixture
   - Formulas and names of substances

2. The amount of chemical substances
   - The amount of substance
   - Atomic and molecular mass
   - Molar mass

3. Atomic bonds:
   - Ionic bond
   - Covalent bond
   - Metal bond

4. Molecular bond and physical states

5. Disperse Systems
   - The right solution
   - Colloid solutions
   - Concentration of solutions
   - Solubility
   - Colligative properties

6. Chemical equilibrium
   - Electrolytes and Protolithic reaction
   - Acids and bases
   - Hydrolysis
   - Titration

• Buffers and pH

7. Oxidation and reduction reactions
8. A brief overview of inorganic compounds.
9. Importance and role of organic chemistry
10. Structural characteristics of organic compounds (hydrocarbons, hydrocarbon derivatives: alcohols, aldehydes, ketones, carboxylic acids, ethers, esters, amino acids, carbohydrates, lipids)
11. Nucleophilic substitutions, radical reactions, oxidations and reductions

Course name: **AGROPHYSICS**
Number of ECTS credits: **3**

Content:
An overview of basic physical concepts that are the basis of understanding processes in the atmosphere.

- energy forms (kinetic, potential, elastic, internal, chemical, electrical, etc.) and ways of increasing, decreasing and changing energy (work, heat)
- intensive and additive physical quantities and concepts of density, pressure, concentration, temperature, potential, conductivity, optical properties
- global climate change, global warming, atmospheric pollution
- planet Earth, seasons and solar radiation
- the composition of the atmosphere, the basic meteorological quantities

- the basics of climatology and explaining the causes of climate and climate change
- basics of various technologies in remote sensing (satellite, optical recording systems, GPS)

Course name: **MATHEMATICAL METHODS**
Number of ECTS credits: **6**

Content:

- Sets. Number sets (natural, rational, real, complex numbers). Equations and inequalities. Absolute value. Interest account. Natural growth. Applications in agriculture.
- Sequences. Limits of sequences. Functions of one variable. Graph of a function. Analysis of functions. Derivative. Integral. Extrema of functions. Applications in agriculture.
- Functions of two variables. Partial derivatives. Extrema of functions of two variables. Applications in agriculture.
- Matrix calculus. Definition of a matrix and basic operations. Determinant. Systems of linear equations. Vectors. Applications to agriculture.
- Combinatorics and probability calculus. The notion of probability. Probability of compound events. Conditional probability. Bayes' formula. Discrete random variables. Normal distribution. Applications to agriculture.

Course name: **LAND USE AND SOIL PROTECTION**
Number of ECTS credits: **6**

Content:
Students will be acquainted with:
Basic knowledge of geology:
- geological processes (activity of tectonic plates) and Earth formation and composition,
- rock weathering processes and chemical and mineral composition of stones from the Earth's crust (igneous, sedimentary and metamorphic rocks),
- types and properties of minerals,
- products of weathering and their role in soil.

Soil formation:
- development of soil science,
- soil formatting factors (clime, parent material, topography, time, human activities) and soil formation.

Soil composition:
- soil organic matter (the global carbon cycling, accumulation and decomposition, composition, properties and types of humus, types of organic soils),
- role of fauna and flora in soil,
- soil air (oxidation and reduction processes, composition of soil atmosphere, gas transport),
- soil water (forms, properties, hydrological cycle and soil-water measuring methods),
- mineral composition of soil.

Soil properties:
- morphological soil properties (consistence, structure, texture, colour, porosity, soil temperature, heat soil, humidity),
- chemical soil properties (soil colloids anion and cation sorption capacity, buffering, soil pH).

Soil classification:
- properties of soil horizons,
- Slovenian soil description and classification,
- soil description and classification on Word Reference Base (WRB/FAO).

Cycles of elements in the system soil-plant-atmosphere:
- macronutrient (nitrogen, phosphorus, potassium, calcium, magnesium and sulphur),
- micronutrient (Fe, Mn, Cu, Zn, B, Cl, Mo, Se).

The impact of human and natural processes on fertility of the land:

- soil fertility and evaluation (soil sampling and analyses, interpretation of analyses results, soil information system),
- human impact on soil quality and fertility,
- soil pollution (organic and inorganic pollutants, sources and types of pollution – industry, transport, agriculture, legislation in the field of conservation of soil fertility and soil quality),
- Landslides and soil erosion (problems, types, impacts measures and techniques).

Course name: **FRUIT GROWING**
Number of ECTS credits: **6**

Content:
- Botanical classification and other groupings of fruit plants.
- Origin, Distribution, Climate and Soil Requirements,
- Pomological properties of most important fruit varieties
- Ogranography, Phenophases
- Establishing the orchard; selection of fruit variety and rootstock, choosing the site, preparation of the soil, settle the infrastructures, planting the trees, preparation of trellis
- The basics of fertilization
- The basics of irrigation
  Integrated and Organic fruit production
- Technological measures influencing the vegetative growth/reproduction relationship of fruit plants (pruning, bending, plantation density…).
- The most important training systems
- The basics of fruit plant propagation
- Diseases and pest control in fruit orchard
- Exsotic fruit species
- Mediterranean fruit species
- Temperate fruit species

Course name: **AGROECOLOGY**
Number of ECTS credits: **6**

Content:
1. Agroecology. definitions, principles, objectives. Agroecology in the context of intensive and sustainable agriculture. The importance and potentials of agroecolgy in different agricultural systems.
2. Agroecosystems. Knowledge of different agroecosystems and to study their characteristics, differences, advantages and disadvantages. Comparisons of nitrogen cycle, nutrient cycle, energy flow, species, genes, ecological factors. Ecological and environmental problems in agroecosystems. Sustainable agroecosystems. The preservation, maintenance and management of sustainable agroecosystems.
3. Ecological factors: Light, Temperature, Humidity and Rainfall, Wind, Soil, Water in the Soil, Fire
4. Biotic factors
5. Environmental complex
6. Heterotrophic organisms
7. Biodiversity in agroecosystems. The importance of biodiversity in agroecosystems functions.
8. Ecological management
9. Indicators of sustainability
10. Agriculture, Society, and Agroecology
11. Presentation of key online databases for agroecology and agrobiodiversity

Course name: **FOREST AND WOOD MANAGEMENT**
Number of ECTS credits: **6**

Content:

1. Basics of the forest structure, growth and yield – students familiarize themselves with basics of tree growth, development of the forest stands, specifics of tree growth, ecological factors that affect tree growth and possible ways to increase yield from the forest
2. Silviculture and tending as a basis for the production of high quality and high value wood. We will present different silvicultural practices from monocultures to selection cut system. Thinning will be presented as a basic tool of silviculture and different thinning techniques will be presented and explained; specific of silviculture in Slovenia will be discussed as well
3. Forest management planning is a basis for systematic forest management – we will present different concepts of, as well as basics of planning in forestry, legislative framework of forestry planning in Slovenia, importance of communication between forest owner and forester, and forest owners rights and duties.
4. Forest production will be presented including different techniques of felling trees, basics of the forest operations will be presented as well as forest mechanisation, construction of forest roads and skidding trails (including legislation)
5. Wood anatomy - Microscopic and macroscopic identification of wood
6. Primary wood products and solid wood composites - types, manufacturing, properties and uses
7. Particle and fibre based wood panels – types, manufacturing, properties and uses
8. Wood technology
    - Wood moisture content and density
    - Mechanical properties of wood
    - Viscoelastic properties of wood

Course name: **HORTICULTURE**
Number of ECTS credits: **6**

Content:

Introduction to Horticulture:
- methods of production (organic, integrated, conventional),
- horticultural plant,
- legislation in the field of food production,
- growth factors (light, heat, water, air)

Basics of soil tillage systems:
- basic and complementary treatment,
- importance of crop rotation.

Protected areas:
- types of protected areas,
- use of protected areas,
- selection of protected areas,
- equipment of protected areas.

Basics of Irrigation:
- irrigation systems and equipment,
- irrigation techniques,
- advantages and disadvantages of irrigation,
- irrigation techniques in vegetables.

Basics of fertilization:
- methods of fertilization,
- types of fertilizers.

Vegetable protection:
- pesticides,
- pests and diseases,
- weeds.

Basic morphological and biological characteristics of individual groups of vegetables:
- lettuces,
- brassica vegetables,
- fruit vegetables,
- roots vegetables,
- bulbs vegetables,
- tubers vegetables,
- legumes,
- perennials.

Growing vegetables:
- seed and seeding,
- cultivation of plants,
- hydroponic vegetable production.

Storage:
- air cooling,
- hydro cooling,
- vacuum cooling.

Timber raised garden bed

Course name: **COMPUTER PRACTICUM**
Number of ECTS credits: **3**

Content:

- Computer engineering for e-agriculture
  Wireless technologies
  Global Positioning System
  Geographic information systems
  Computer-controlled devices (automated systems)
  Smartphone mobile apps in agriculture
  RFID
  Knowledge management systems
  Agricultural resources and services management
  Computer-aided manufacturing
  Computer-aided design
- E-agriculture
- Computer tools for e-agriculture
- Introduction to bioinformatics

Course name: **VITICULTURE**
Number of ECTS credits: **6**

Content:

- The state of viticulture in Slovenia and in the world, the importance of viticulture.
- Vitis species classification (genus Vitis), classification of European grape varieties by geographical origin.
- Classification of wine-growing areas in the Republic of Slovenia and connection with geographical indications of wines.
- Environmental conditions necessary for the vine.

- Organography: roots, trunk, cane, shoot, bud, leaf, tendrils, flower, cluster, berry.
- Training systems and their influence on the quality of grapes. Types of old and fruiting wood.
- Vineyard cultural practice: pruning, shoot thinning, hedging, etc. and their impact on grape quality.
- Nutrient requirements of the vines and fertilization of the vineyard.
- Vineyard floor management (cultivation or greening of the vineyard).
- Ampelography: methods of describing and distinguishing vine varieties and species.
- Phenological stages of vine development.
- Pests and diseases of the vine.
- Decision support systems (epidemiological models)
- Vine varieties and rootstocks cultivated in Slovenia.
- Establishment of a new or renewal of a vineyard: preparation of the soil, selection of the vine variety and rootstock variety.
- Climate changes and grapevine development.
- Sustainable approaches in grape production.

COMPULSORY COURSES FOR THE 2ND YEAR OF STUDY

Course name: **PLANT BIOCHEMISTRY**
Number of ECTS credits: **6**

Content:
1.) Leaf Cells and its Metabolic Compartments.
2.) Photosynthesis.
The origin of Photosynthesis, Pigments that capture energy from sunlight, Electron Transport Process, Generation of ATP, chemiosmosis, Calvin-Bassham Cycle, Photorespiratory Pathway, Consumption of Water.
3.) Polysaccharides as a Storage and Transport
Forms of Carbohydrates Produced by Photosynthesis.
4.) Nitrogen Fixation and Nitrate Assimilation.
5.) Lipids as a Membrane Constituents and Carbon Stores.
6.) Secondary Metabolites and their Metabolism
Immunomodulatory Agents, Phytoalexins, Phytoanticipins, Cyanogenic Glycosides, Glucosinolates, Alkaloids, Isoprenoids, Phenylpropanoids, Phenolic Compounds.
7.) Multiple Signals Regulate the Growth and Development of Plant Organs and Enable Their Adaption to Environmental Conditions (climate change). The role of plant hormones in plant growth, maturation, aging and defense.

Course name: **PLANT PHYSIOLOGY**
Number of ECTS credits: **6**

Content:
(a) Water balance of plants
Water absorption, transport and transpiration. Water status of the plant.
(b) Mineral nutrition
Macro- and microelements in the soil, availability and concentration of nutrients in the rhizosphere, absorption into roots (soil pH effect). Mechanisms of absorption in plant cell (permeability of membranes, membrane transport mechanisms, primary and secondary active transport). Short distance transport. Xylem and phloem transport and regulation. Mineral nutrition and plant growth and development. The role of symbiosis (mycorrhizas and nitrogen fixation) in plant mineral nutrition with an emphasis omn agricultural crops.
(c) Photosynthesis

Light and carbon reactions. C3, C4, and CAM metabolism. Energy efficiency of photosynthesis. Measurements of photosynthesis. Impact of environmental factors on photosynthesis. Photosynthesis and agricultural cropsBB .

(d) Respiration

Respiratory steps: glycolysis, Krebs cycle, electron transport system, oxidative phosphorylation.

(e) Secondary metabolites

Terpenes, phenolic compounds, tannins, alcaloides, nitrogen-containing compounds.

(f) Plant hormones

The role of plant hormones (auxins, cytokinins, gibberellins, abscisins, ethylene) and other growth regulators. Synthetic growth hormones and their application in agriculture.

(g) Abiotic stress in plants

Specificity of plant growth and function in different stressful environments. Recognition of stress symptoms in plants and plant responses to stress.

Course name: **STATISTICAL METHODS**
Number of ECTS credits: **6**

Content:

- Introduction. What is statistics? Examples of applications of statistical methods in natural sciences. Population. Sample.
- Random variables. Continuous and discrete random variables. Examples of random variables. Probability function, probability density function, cumulative distribution function.
- Descriptive statistics. Frequency distribution. Measures of central tendency. Quantiles. Measures ofvariability.
- Sampling. Introductory examples. Random sampling. Sampling distribution. Standard error. Confidence intervals.
- Graphical methods of data representation. Histogram. Scatter plots. Box and whisker plot. QQ-diagram.
- Hypothesis testing. Null hypothesis, alternative hypothesis. Errors in hypothesis testing.
- Correlation and dependence. Correlation analysis and linear regression. Non-linear dependencies.
- Simple analysis of variance (ANOVA) and HSD test

Course name: **BASICS OF GENETICS**
Number of ECTS credits: **6**

Content:

- DNA, RNA structure
- Fundamentals of Mendelian inheritance,: lows of inheritance, pedigree analysis, inheritance of dominant and recessive genes, molecular basis of dominant and recessive mutations.
- Avtosomal and sex linked inheritance.
- Basic molecular technologies
- Genome organization:
- Cromosome structure: morphology and structure elements of Eukaryote chromosome: telomere, centromere, organization of DNA on the chromosome, construction of chromatin, heterochromatin
- Genes and organization of genes
- Organelle genomes
- The path from DNA to protein
- Gene expression
- Mutations, repair mechanisms
- Application of markers in agriculture
- Genomic projects in agriculture

Course name: **OLIVE GROWING AND OLIVE PROCESSING TECHNOLOGY**
Number of ECTS credits: **6**

Content:
- Olive oil and table olives production in Mediterranean countries, USA, Australia and state of olive growing in Slovenian territory
- Botanical classification
- Biological and botanical properties of olive trees
- Pomological properties of olive varieties (varieties for oil production and table olives varieties, pollinating relations, self-compatible varieties, self-incompatible varieties)
- Basic technologies in the propagation of olive trees
- Ecological requirements for olive trees
- Selection of area, soil and infrastructure management, design of orchard planting and varieties selection
- the basic technologies of growing oil trees, nursing orchards till fertility, managing in fertility (the main training systems, fertilization till fertility and in fertility, pruning, irrigating, harvesting
- Sustainable olive growing (integrated protection, economically important olive pests and diseases', management in integrated protection, ecological production)
- Olive oils production technologies: traditional and continuous production.
- Storage of olive oils (filtering and bottling).
- Chemical and sensory characteristics of olive oils.
- Table olives processing technology
- Chemical and sensory characteristics of table olives.
- Production of pomace olive oil: extraction procedures and oil refining
- Olive oils classification. European classification and legislation
- Olive oils quality (acidity, peroxide value, spectrophotometric parameters in UV, fatty acid methyl and ethyl esters content, sensory analysis) and purity criteria (fatty acid composition, sterol content and composition, waxes, stigmastadiene and 2-glyceril monopalmitate content, ΔECN42).
- Chemical composition of olive oils: triacylglycerols, fatty acid composition, minor components (aliphatic alcohols, aldehydes, biophenols, pigments, hydrocarbons, sterols, vitamins, triterpenic alcohols, waxes).
- Olive mill waste waters and olive by-products: sustainable reuse of olive by-products and vegetable water, transformation into a new market product (compost, soils, fertilizers) for vegetable production and animal feed. Slovenian and European legislation.

Course name: **NATURE CONSERVATION AND SUSTAINABLE AGRICULTURE**
Number of ECTS credits: **3**

Content:
Main topics:
- Nature protection history
- Systematics by examples (natural values, biodiversity)
- Evaluation of nature's parts
- Conservation of nature
- Protected areas
- On-line databases of protected areas
- Slovenian organizations for nature conservation and their functions
- Nature / Environment and public opinion
- International organizations and conventions of nature protection and EU regulations
- Sustainable agriculture (definition, concept, goals)
- Farming systems
- Environmental pollution due to agriculture: methane emissions, fertilizers as a source of pollution and control measures, pesticides and herbicides as source of pollution and control measures

- Management of natural resources: land, water – irrigation problems
- Sustainable Agriculture, Biodiversity and Climate Change
- Biodiversity of agricultural plants (current situation, importance, genetic erosion, conservation strategies)
- Green revolution
- Genetic modified plants
- Food security
- Food waste
- National and international agricultural policy

Course name: **PLANT PROTECTION, DIAGNOSTICS AND PHYTOPHARMACY**
Number of ECTS credits: **6**

Content:
- The influence of pests and deseases in crop production.
- The influence of biotic and abiotic factors on harmfull organisms.
- Harmfull organisms.
- The principles of Phytopatology.
- The principles of Entomology.
- The principles of Herbology.
- The principles of Phytopharmacy.
- Good Agricultural practice and Good plant protection practice principles.
- EU and Slovene legislation on Plant protection Plant Protection Products and Environment protection.
- Online databases on pathogens in agriculture (EPPO,..)

Laboratory work: Acquaintance with the identification procedures and methods of different harmful organisms.
Project work: Laboratory or field implementation of the planned procedure concerning the specific problem related to plant protection and determination of all parameters in accordance with the standards valid.
Field practice: Identification of harmful organisms in the field, visit to laboratories, field trials and other premises related to plant protection.

Course name: **PRACTICAL TRAINING IN WORKING ENVIRONMENTS I**
Number of ECTS credits: **9**

Content:
Students will perform practical training under expert mentoring in various organizations, engaged with agricultural production, marketing of agricultural materials and crops, and agricultural consultancy. Students will be able to practice in the work environment or in organizations such as: cooperatives, agro-forestry chambers, companies, public institutes, societies, specialized farms and others. Practice is also possible in the scientific and research institutions of the University of Primorska.
Practical training will be organized in agreement with the coordinator of study practice at the faculty department, and appropriately trained mentors in organizations, in order to familiarize students with the production and organization of the company, taking into account the specific field of activity of each company.

COMPULSORY COURSES FOR THE 3RD YEAR OF STUDY

Course name: **ZOOTECHNICS IN THE MEDITERRANEAN AREA**
Number of ECTS credits: **6**

Content:
The course is divided into individual topic areas:

- The characteristics of animal husbandry in the Mediterranean area with emphasis on breeding sheep
- Familiarization with different methods of sustainable breeding of individual kinds and categories of domestic animals.
- Familiarization with importance of sustainable livestock production for food preparation and life of humans and comparison of role of animal species in an environment.
- Familiarization with biological bases of animal breeding.
- Teaching about evolution of breeds and their characteristics.
- Planing of breeding with regard to natural conditions and market requirements.
- Studying different solutions for rebuilding and new building of barns and associated farm facilities in accordance with current legislation.
- Familiarization with importance of environment protection, particularly from the point of view of animal breeding.
- Obtaining ethical attitude towards animals.
- Learning how to consider ethological and ergonomic rules and regulations of breeding.

Course name: **PLANT BREEDING AND BIOTECHNOLOGY**
Number of ECTS credits: **8**

Content:
The importance of plant breeding and the goals of modern plant breeding.
Importance of plant genetic resources. Strategies for conservation of plant genetic resources and methods for characterization of accessions.
Qualitative and quantitative traits.
Basic characteristics of breeding self-pollinating plants, cross-pollinating plants and vegetatively propagated plants. Methods of maintenance and propagation of different cultivar types.
Breeding hybrid cultivars and production of hybrid seeds.
Methods for creating new variability.
Marker-assisted selection.

Plant tissue culture techniques as a basis for genetic manipulations (regeneration of plants from genetically modified cells).
Plant tissue culture techniques for the generation of new plant genetic resources (in vitro crossing techniques: embryo rescue, protoplast fusion) and for dihaploid induction.

The impact of biotechnology on crop production.
Recombinant DNA techniques. Plant transformation techniques.
DNA vectors for plant transformation. Construction of vectors. Promoters. Selection genes. Reporter genes.
Modern cloning methods (Gateway cloning, Gibson assembly cloning).
Genome editing techniques (ZFN, TALEN, CRISPR-Cas).
Overview of already developed transgenic and genome-edited agricultural plants.
Legislation in the field of genetic engineering and biosafety. Intellectual property in agricultural biotechnology.
Databases of genetically modified plants and gene banks.

Course name: **TECHNOLOGIES FOR FOOD PROCESSING IN AGRICULTURE**
Number of ECTS credits: **3**

Content:
- Properties of agriculture products
- Methods of drying
- Storage
- Paraboiling and milling
- By-products/Biomass utilization
- Postharvest management of fruits and vegetables
- Food preservation and processing of fruits and vegetables
- The basics of food chemistry for technologists
- Sustainable approaches in food processing in agriculture

Course name: **BASICS OF ENTREPRENEURSHIP AND MARKETING**
Number of ECTS credits: **6**

Content:
Course content will consist of sections: entrepreneurship and marketing.
a. ENTREPRENEURSHIP
- The definition and importance of entrepreneurship
- The definition and importance of entrepreneurshipBusiness Plan
- Examples of entrepreneurship (entrepreneur)- an analysis of good practices

a. MARKETING
- Development and definition of marketing.
- Basic marketing concepts.
- Market environment: analysis of internal and external environment.
- Consumer behavior in the purchase
  decision-making process: definition, the factors that influence the consumer behavior in the purchase decision-making process.
- Market research: market research process.
- Segmentation and positioning.
- Marketing mix: product, price, distribution, promotion.
- Brand: basic concepts.

Course name: **PROJECT PLANNING AND MANAGEMENT**
Number of ECTS credits: **3**

Content:
- Projects: definition and project types, basic characteristics of projects, implementing strategy trough projects, designing objectives and goals of the project, evaluation of projects
- Project planning: planning time, costs, personnel and risks.
- Organising and implementating projects.
- Project management: project manager and principles of project management and project implementation, project teams.
- Project administration, project documentation.
- Agricultural projects, project applications.
- Actual strategies of agriculture and rural development in Slovenia and EU

Course name: **PRACTICAL TRAINING IN WORKING EVIRONMENTS II**
Number of ECTS credits: **10**

Content:
Students will perform practical training under expert mentoring in various organizations, engaged with agricultural production, marketing of agricultural materials and crops, and agricultural consultancy. Students will be able to practice in the work environment or in organizations such as: cooperatives, agro-forestry chambers, companies, public institutes, societies, specialized farms and others. Practice is also possible in the scientific and research institutions of the University of Primorska.

Practical training will be organized in agreement with the coordinator of study practice at the faculty department, and appropriately trained mentors in organizations, in order to familiarize students with the production and organization of the company, taking into account the specific field of activity of each company.

Course name: **FINAL SEMINAR**
Number of ECTS credits: **6**

Content:
The aim of the final seminar is that student studies intensively the literature from the field of selected topic. He must understand the content and professionally present it.
The course lecturer, together with other teachers who are involved in the implementation of Agronomy study programme, presents potential seminar topics, with relevant literature. Student is motivated to suggest topics that it is interested in, and looks for additional literature.

Presentation of the instructions for preparation of the final seminar and to give student guidelines during the preparation of the seminar.

Course name: **FIELD CROP PRODUCTION**
Number of ECTS credits: **6**

Content:
- The history of field crop production
- Origin, variation and spread of field crop production in the world and in Slovenia
- Botanical and agronomical classification of field crops (cereals crops, oilseeds, cotton, tubers and root crops, honey plants, forage crops, field vegetables)
- The role and importance of the ecosystem and growth factors for field crops production (soil, climate)
- Characteristics of individual field crops:
    - morphology
    - growth and development (determination of phenophases)
    - soil treatment
    - method of sowing/planting
    - fertilization
    - irrigation
    - plant protection (weeds, diseases, pests)
    - crop rotation
    - time and method of harvest
    - field crop storage
    - usefulness
- The importance of alternative field crop production
- Basic principles of integrated crop management
- Basic principles of organic crop management

- Gene banks and genetic diversity of field crops
- Case studies

ELECTIVE COURSES

Course name: **AGROBIODIVERSITY AND GENE BANKS**
Number of ECTS credits: **6**

Content:

- The distinction between indigenous, domestic, domesticated varieties, formation of varietal structure of the leading crops in the region
- The importance of diversity of plants: domestication, evolution, taxonomy, presentation of the Mediterranean gene center as an origin of agriculture, the development of modern agriculture and its impact on biodiversity.
- Conservation programs in agriculture: FAO and Biodiversity International
- Sources of genetic variability, genetic erosion, inventarization of genetic resources in the field
- Collecting of genetic resources
- Gene banks, databases
- Documentation of genetic resources
- Examples of genetic evaluation of Mediterranean fruit species
- Type of conservation of genetic material in gene banks; in situ and ex situ conservation
- Underutilized plants
- Populations of plants and variability
- Investigation of plant genomes and application
- Biotechnological methods for agrobiodiversity research, the use of DNA markers
- Methods for determination of genetic relationships

Course name: **APPLIED ENTOMOLOGY**
Number of ECTS credits: **6**

Content:

- Introduction in entomology – its importance, insect diversity
- Insects morphology and anathomy
- Reproduction, growth and development (life cycles, ontogenic development, generations, diapause, migrations, dispersions, environmental influence)
- Insect communication
- Evolution ecology of insects (life strategies, reproductive biology, coevolution, insect-plant interactions)
- Ecology of insects (population biology, limitations, climate influence, population effects of predation)
- Phytophagous insects and vectors of phytopathogenic diseases
- Predators and parasites (types with examples, prey/host selection, parasitoids)
- The most important phztophagous arthropods, diseases and control strategies.
- Indirect interactions and ecosystem role of insects
- Survey and monitoring of insect populations and assemblages (bioindicators, biological monitoring)
- Entomological methods – field survey methods (pasive and active), material analysis and identification, ecological methods of insects research

Course name: **ARBORICULTURE**
Number of ECTS credits: **6**

Content:
The history of modern arboriculture. The role and function of trees in the urban environment. Growing conditions in the urban environment and ecology tree. The basics of tree biology (tree, tree growth and morphology, functional anatomy tree tissues, basic tree physiology, biomechanics base). Response of trees to abiotic damage (drought, mechanical damage, compaction, contamination of ground-water-tree with (de-icing) salts, gases and other pollutants). The most important adverse effect of biotic factors (pests and diseases) on the physiology of individual tree species and modern methods of controlling. Methods for evaluating the vitality of individual tree species. Hazardous trees. Planting trees. Pruning of urban trees. Coating and treatment of injuries. Other techniques of tree care. The management of urban trees and tree care planning, survey methodology and records, arboricultural research.

Course name: **SOIL BIODIVERSITY AND ECOSYSTEM SERVICES IN SUSTAINABLE AGRICULTURE**
Number of ECTS credits: **6**

Content:
Students become acquainted with soil biodiversity on different levels (e.g. genetic, functional, physiological, spatial, temporal), and with methodological approaches used for the assessment of soil biodiversity and its segments. Students become acquainted also with roles and importance of soil biota in ecosystems functioning, sustainable agriculture practices and in ecosystem services. At the same time students learn the basic principles of scientific thinking, identification and evaluation of the new knowledge, and get to know options for its application in practice.

The course is divided into the following sections:
1. Soil environment (abiotic factors, soil as a habitat, soil structure and soil biota, rhizosphere).
2. Sustainable agriculture – basic definitions.
3. Groups of soil organisms (taxonomic and phylogenetic), and their basic characteristics.
4. Specificity of soil biodiversity (structural, physiological, functional diversity).
5. Traditional and modern approaches used in research of soil diversity, their advantages and limitations.
6. Introduction to molecular ecology of soil organisms.
7. Ecosystem services.
8. Connection between biodiversity, ecosystem function and ecosystem services.
9. Strategies for conservation of ecosystem services and sustainable development in connection to soil biodiversity.
10. Threats to soil and soil biodiversity and ecological consequences of soil degradation.
11. The social and economic value of soil biodiversity.

Course name: **FLORAL BIOLOGY AND POLLINATION ECOLOGY**
Number of ECTS credits: **6**

Content:
This interidisciplinary course will survey the science of pollination biology, including the discovery of plant pollination in the late seventeenth century, plant adaptations to animal pollination and how they evolve, the diversity of mating systems, floral traits in connection to pollinating animals, the many ways that plants manipulate animals to achieve pollination via general and/or specific plant-pollinator interactions, and the importance of pollination to human society.

Contents

Essentials of flower design and function
- Why pollination matters?
- Floral design and function
- Pollination, matting and reproduction in plants
- Evolution of flowers, pollination and plant diversity

Floral advertisments and floral rewards
- Visual signals and floral color
- Olfactory signals
- The biology of pollen
- The biology of nectar
- Other floral rewards
- The environmental economics of pollination

Pollination syndromes
- Types of flower visitors: syndromes, constancy and effectivenes
- Generalist flowers and generalist visitors
- Biotic and abiotic pollination
- The timing and patterning of flowering
- Competition and pollination ecology
- Pollination in different habitats
- Pollination of crops
- The global pollination crisis

Course name: **NURSERY (FRUIT PLANTS AND GRAPEVINE PROPAGATION)**
Number of ECTS credits: **6**

Content:
- Overview of the production of fruit plants and grafted vines.
- Sexual and asexual reproduction of plants.
- Production of generative and vegetative rootstocks.
- Seed storage and germination.
- Legislation on the field of production of planting material.
- The importance of hormones in plant propagation.
- The influence of rootstock on growth and development of grafted plant and to adaptation on environmental conditions.
- The importance of the physiological age of stock plants and methods for regeneration.
- Techniques of vegetative reproduction and techniques of grafting.
- Review of the most important rootstocks for different plant species.
- Selection and certification. The process for production of stock plants.
- Processes for ensuring disease free stock plants.

Course name: **SOIL ECOLOGY**
Number of ECTS credits: **6**

Content:
Students become acquainted with soil ecology, soil protection and sustainable soil management on different levels (e.g. ecology, biodiversity, function, conservation). Students get an overview of elements important in soil management and maintenance of living soil. These include: soil organic matter, pollution and degradation, plant impact on soil health and others. At the same time students learn the basic principles of scientific thinking, identification and evaluation of the new knowledge, and get to know options for its application in practice.

The course is divided into the following sections:
1. Historical overview of the development of soil ecology and soil protection.

2. Soil as a habitat. Basic properties of soil important for soil life.
3. Primary production processes in soil (taxonomic and functional groups of organisms, activity and function of autotrophic organisms).
4. Secondary production processes in soil (taxonomic and functional groups of organisms, activity and function of heterotrophic organisms).
5. Traditional and modern approaches used in research of ecology of biological communities, populations and biodiversity in soil.
6. Living soil – definition. Importance of soil organic matter for soil health and management of soil organic matter.
7. Decomposition of soil organic matter. Basics of making and using composts.
8. Importance of plants for soil health (e.g. cover crops, crop rotations, erosion prevention, rhizosphere as a concept).
9. Managing soil water. Irrigation and drainage.
10. Mineral nutrients in soil, their importance and management.
11. Basics on soil threats and degradation (e.g. soil pollution, salinization, acidification, urbanization, erosion, compaction).
12. Basic principles of soil remediation.

Course name: **ECONOMICS OF AGRICULTURE**
Number of ECTS credits: **6**

Content:
The course contains the following study subjects: Agriculture in economic system, Role and importance of agriculture in economic development, Types and characteristics of agricultural households (enterprises, cooperatives, family farm), Agriculture and state (market liberal model of agricultural development, agricultural protectionism), Agricultural policy doctrines in the contemporary world, Agriculture and agricultural policy in Slovenia, Economics, social and political situation in agriculture, production, consumption, size and farm structure, Natural environment in theory, Agricultural and environment protection, Strategy of sustainable economic development, Economic aspects of interactions between agricultural production and natural environment.

Course name: **MICROBIOLOGY OF AGROECOSYSTEMS**
Number of ECTS credits: **6**

Content:
Students become acquainted with microbiology as a scientific discipline and its importance for agroecosystems. At the same time students learn the basic principles of scientific thinking, and integration of the new knowledge in agroecosystems.
The course is divided into the following sections:
- Introduction to environmental microbiology and its historical development and it is importance in agriculture.
- Microbial groups and their basic characteristics (structure, metabolism and cell function) – archaea, bacteria, eukaryotes.
- Basics of microbial metabolism and growth.
- Introduction to the molecular biology of microorganisms – methodology.
- Introduction to microbial ecology (community and population ecology).
- Importance of soil microbes in biogeochemical cycles.
- Microbiomes in agroecosystems.

Course name: **PLANT MOLECULAR DIAGNOSTIC**
Number of ECTS credits: **6**

Content:
Development of molecular diagnostics and possible applications. Comparison of classic techniques for identifying pathogens with molecular techniques. Molecular techniques and technologies: Polymerase chain reaction, Real time polymerase chain reaction, Loop mediated isothermal amplification (LAMP), techniques for detection of PCR products, detection using antibodies. NGS technologies. DNA barcodes and development of oligonucleotides for identification of pathogens and pests. The importance of molecular techniques for rapid and accurate identification of pathogens and pests. Techniques of isolation DNA and RNA from plant material, insects and microorganisms. Biological databases (sequence database, protein database, etc.). On-site testing for plant pathogens. Methods for detection of genetically modified plants.

Course name: **CONSUMER BEHAVIOR BASICS**
Number of ECTS credits: **6**

Content:
The course deals with the content that allow an understanding of consumer behavior in real life situations.
1. Introduction to Consumer behavior
2. Psychological factors affecting Consumer behavior: motivation, perception, learning and memory, attitudes
3. Sociological factors affecting Consumer behavior: groups, family, role and position of the individual
4. Cultural factors in consumer behavior: the reference group, social class
5. Personal factors in consumer behavior: age and level of family life cycle, lifestyle, personality
6. Purchase decision making process
7. Segmentation and positioning on consumer's market

Course name: **BREWING**
Number of ECTS credits: **6**

Content:
- History of beer brewing
- Characteristics and composition of basic raw materials for beer production (malt, brew water, hops and yeasts)
- Malting process
- Wort production and technology of griding
- Different methods of fermentation
- Maturation, filtration, stabilization and storage
- Cleaning and disinfecting
- Chemical processes in beer production
- Factors affecting the quality of beer
- Use of additives in beer production
- Types of breweries
- Beer types and their characteristics
- Sensory evaluation of beer
- Brewery equipment
- Legislation
- Sustainable approaches in brewing technology

Course name: **AROMATIC PLANTS PRODUCTION**
Number of ECTS credits: **6**

Content:
- The role and importance of the ecosystem and growth factors for cultivation of herbs and aromatic plants.
- An overview of plant classification with the emphasis on plants used in the pharmaceutical industry.
- Basic morphological characteristics of Mediterranean herbs and aromatic plants.
- Agro-ecological requirements for growth and development, and basic cultivation technologies for herbs and aromatic plants.
- Basic cultivation technologies for aromatic plants: soil preparation, planning and maintenance of plantation, basic treatment (fertilization, irrigation), common pests and diseases.
- Propagation of aromatic plants.
- Harvesting and preparing the produce for market.
- Production of plant's extracts, essential oil and drying.
- Chemical analysis of aromatic plants extracts and essential oil, and laboratory testing of drugs.
- Protected medicinal plants in Slovenia.
- The importance of cultivation aromatic plants for local community.
- Gene banks and genetic diversity of aromatic plants.
- Case studies

Course name: **PLANT TISSUE CULTURE**
Number of ECTS credits: **6**

Content:
Development of plant tissue culture methods throughout history.
Laboratory requirements for plant tissue culture cultivation.
Composition of the media. Preparation of the media.
The importance of plant growth regulators at different stages of plant tissue culture growth and development.
Main pathways of plant regeneration: from existing meristems (apical, axillary, adventitious) or by direct or indirect organogenesis (development of the meristem from differentiated tissues).
Optimization of technology to achieve optimal shoot growth, rooting and acclimation.
Formation and characteristics of cell suspensions, callus culture.
Production of secondary metabolites.
Indexing of axenicity and occurrence of sporadic contamination.
Undesirable phenomena and reactions of tissue cultures: hypersensitivity, hyperhydration, shoot tip necrosis.
Methods for obtaining virus-free plants (thermotherapy, chemotherapy). Methods to control the health status of plants.
Preservation of lines: Methods of induced slow in vitro growth, cryopreservation.
Commercial micropropagation: planning process. Determination of the multiplication factor. Experimental design and evaluation of trials.

Course name: **FISHERY**
Number of ECTS credits: **6**

Content:
Subject Fishery includes following topics, covering wide area of fishery science and introduced students into the field:

- Introduction to the fishery, description of the discipline, history and development of fishery

- Biology of selected fishing species, life history, migrations, behaviour ecology in fish reproduction, trophic ecology of fish, structure of food webs
- Population genetics of exploited populations, application of genetic markers in fishery and identification of fishery products
- Fishing techniques in industrial and artisanal fishery
- Aquaculture and breeding of fish, molluscs, genetic manipulations, impact on environment
- Economics of fishery, fishing effort and fishing yield, sustainable yield, optimal exploatation and fluctuations in catch
- Impact of fishing on ecosystem, overexploatation and other threats and measures for conservation of sources, protected areas
- International conventions on fishery and national legislation
- National and EU legislation
- National strategic plan for the development of fishery
- Detection of fish fraud using modern molecular approaches
- Databases that provide access to information on fish species, their distribution, populations, catch data, ecology, legislation, and the status of marine and freshwater ecosystems (e.g., FishBase, FAO Fisheries & Aquaculture Division, AquaMaps, IUCN Red List…).

Subject Fishery include also field course, which will be held in ccoperation with institutions dedicated to the fishery in Slovenia (e.g. Fishery Institute of Slovenia, aquaculture companies). Practical course include laboratory part (fishery biology, morphometric measurements of fish, cephalopods, mussels, basics of application genetic markers in fishery) and field part (learning of fishery gears, infrasture in fishery port, fishing fleet).

Course name: **SENSORY ANALYSIS OF FOODSTUFFS**
Number of ECTS credits: **6**

Content:
The content will include the following themes
Introduction:
Definition, history, importance of sensory analysis.
Sensory and organoleptic analysis.
Conditions for the implementation of sensory analysis.
Physiology of sensory perception:
Senses: taste, smell, sight, hearing, and type.
Sensory receptors. Perception. Recognition. Adaptation. Fatigue.
Basic tastes: sweet, sour, salty, bitter and umami and metallic taste. Factors affecting the perception of a taste.
Sensory characteristics: appearance, color, odor, taste, aroma, texture.
Sensory room: requirements for laboratory, ventilation, temperature, booths, equipment, utensils.
Testing time. The number of sessions.
Samples:
Preparation, size, label, number, repetition. Neutralization. Test solutions.
Sensory testers:
Consumers.
Sensory panel (requirements: number, age, gender, health, skills, interest).
Education of a panel.
Panel supervisor (the role and importance).
Methods for sensory analysis:
Tests of sensitivity (sensory thresholds, identifying basic tastes, smells recognition, memory).
Consumer tests (preference, determination of the admissibility).
Discrimination tests (comparison in pairs, triangle, duo-trio, two of the five, A not A).
Tests using scales (grading, classification, classification, scoring, ranging).

Descriptive analysis (profiling flavor, quantitative descriptive analysis, profiling texture, sensory spectrum, free-choice profiling).
Strengths, weaknesses and applicability of each test.
Sensory analysis of olive oils: sensory characteristics of olive oils, sample preparation, method of assessment features.
Profile sheets.
Statistical methods in sensory analysis

Course name: **MEDITERRANEAN NUTRITION**
Number of ECTS credits: **6**

Content:

- Chapter 1. Basic Concepts in Nutrition
  Introduction to Nutrients, Food Choice, Research and the Scientific Method, Achieving a Healthy Diet, Undernutrition, Overnutrition, and Malnutrition
- Capter 2. Guidelines for Health Eating
  Introduction to Dietary Guidelines, Estimated Energy Requirements, Understanding Dietary Reference Intakes (DRI) , Introduction to Food Safety.
  Mediterranean food consumption patterns: diet, environment, society, economy and health.
  Mediterranean diet pyramid: a cultural model for healthy eating
- Chapter 3. Human Body and Digestion
  Introduction to the Human Body, The Digestive System, Metabolism, Adverse Food Reactions
- Chapter 4. Carbohydrates
  Introduction to Carbohydrates, Digestion and Absorption of Carbohydrates, Glycemic Response, Diabetes, The Functions of Carbohydrates in the Body, Health Consequences and Benefits of High-Carbohydrate Diets
- Chapter 5. Lipids
  The Functions of Lipids in the Body, The Role of Lipids in Food, Nonessential and Essential Fatty Acids, Digestion and Absorption of Lipids
- Chapter 6. Protein
  Introduction to Proteins, Protein Digestion and Absorption, Protein's Functions in the Body, Protein requirements during development, activity and diseases.
- Chapter 7. Vitamins
  Introduction to Vitamins, Fat-Soluble Vitamins, Water-Soluble Vitamins, Antioxidants, Phytochemicals
- Chapter 8. Minerals
  Introduction to Major Minerals, Introduction to Trace Minerals
- Chapter 10. Performance Nutrition and Chapter 12. Lifespan Nutrition
  Introduction to Performance Nutrition, Sports Nutrition, Water and Electrolyte Needs Introduction to Nutrition Across the Lifespan, Pregnancy, Infancy, Toddler Years, Older Adulthood
- Chapter 11. Weight Management
  Introduction to Weight Management, Indicators of Health: Body Mass Index, Body Fat Content, and Fat Distribution, Health at Every Size

Course name: **BRADN MANAGEMENT**
Number of ECTS credits: **6**

Content:

- Brand concept
- Brand alanced view
- Brand strategies
- Brand image and identity
- Brand architecture

Course name: **URBAN AGRICULTURE**
Number of ECTS credits: **6**

Content:
- Definition of urban agriculture
- History of urban agriculture
- Current situation in urban agriculture
- Examples of good practises in developed countries
- Functions of urban agriculture (spatial, economic, sociological, ecological)
- Health and environmental risks associated with urban agriculture
- Basis characteristics of modern urban agriculture
- Different forms of urban farms (gardening, SPIN farming, community supported agriculture–CSA, urban forestry, livestock and aquaculture)
- Problems and benefits of urban agriculture
- Planning and designing an urban farm
- Re-use of waste water/organic waste on an urban farm
- Expansion services for urban and periurban agriculture

Course name: **ENOLOGY**
Number of ECTS credits: **6**

Content:
The content of the subject is following general and specific competences. A holistic approach towards understanding the economical meaning of winemaking in connection with winegrowing will be presented. As well there will be presented: basics of wine (bio) chemistry, microbiology and technology of wine production upon the desired style of wine; basics of sensorial evaluation; nutritional importance of wine consumption and global wine trade.
Main topics of lectures:
- economical, cultural and historical importance of winemaking in Slovenia and Slovenian Istria;
- importance of winemaker in planning harvest, preserving quality of grape and in wine production;
- wine classes under Wine-law;
- basics of winemaking technology and technological schemes of wine production upon type of wine (red, white,…);
- basics of wine (bio)chemistry and microbiology;
- basics of wine tasting-sensorial evaluation;
- nutritional approach and health benefits of wine moderate consumption;
- review about global wine market and prediction of its further development.

Main topics of laboratory work:
- basic chemical analyses of grape, must and wine;
- basic microbiological analyses of grape, must and wine;
- methods of sensorial evaluation of wine;
- wine off odors, diseases and their suppression:

basics procedures of wine production.

Course name: **BEEKEEPING**
Number of ECTS credits: **6**

Content:
1. The significance and history of beekeeping - student understands the basic meaning of bees for a human; knows history of Slovenian beekeeping and organisation in beekeeping societies
2. Biology of honey bee colony - student knows bee subspecies and relatives; knows anatomy of bee body; knows social structure of honey bee colony; knows basics of reproduction and genetics in bees, becomes acquainted with selection
3. Bee residence and beekeeping equipment - student knows bee residence, manages the conditions for living, knows hives and beekeeper's equipment
4. Life cycle of honey bee colony - student knows beginning of laying eggs in spring, development and colony building, swarming, collecting nectar, honeydew, water, pollen and propolis, bee living in autumn and winter
5. Bee pasture and bee products - student knows the most important honey plants and forest pasture, understands pollination of cultivated plants
6. Apiary work - student knows work in apiary through all seasons
7. Basics of queen rearing – student knows the methods of queen rearing; becomes acquainted with work of professional services and registered breeding stations
8. Bee diseases and parasites in apiary -student knows the most important diseases and parasites of honey bee colony
9. Protection of bees against poisoning - student knows consequences of pesticide application, knows to secure bees in time of application
10. Guidelines for good hygiene habits in beekeeping - student becomes acquainted with food safety and knows how to ensure safe food products.

Course name: **ARTIFICIAL INTELEGENCE AND MACHINE LEARNING**
Number of ECTS credits: **3**

Content:
- Introduction and overview of Artificial Intelegence and Machine Learning. Deep learning. Computer vision. OpenAI. Generative AI. ChatGPT. Ethical Standards in AI.
- Python Basics. Python environment. Basics of the python language, operators, data structures, control structures, functions and modules, libraries.
- Exploratory Data Analysis. Visualization. AI examples.

Course name: **RURAL TOURISM**
Number of ECTS credits: **6**

Content:
1. Rural tourism: basic concepts and definitions
2. Development and characteristics of rural tourism: trends and perspectives
3. Selected forms of rural tourism:
4. Tourism on farm (agritourism)
5. Wine tourism (wine routes)
6. Sustainable solutions: the case of "smart villages"
7. Power relations and the centre-periphery relationship
8. Sustainable integration strategies in the context of rural tourism development